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Combined Hydraulic and Disc Brake System for Four-Wheeler

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ABSTRACT: -

The concerns of how active safety systems interact with brake system equipment need to be thoroughly investigated in light of current trends in the automotive industry. Additionally, there are chances to reduce the power take-off of certain parts, such as disc braking systems. Disc brakes, frequently spelled "disk" brakes, work by spinning a metal rotor that is flat and disc-shaped. A caliper presses the brake pads against the disc when the brakes are engaged, slowing the wheel in the same way that you would squeeze a spinning disc between your fingers to halt it.An automobile's disc brake is composed of two components: Stationary pads and a revolving axially symmetrical disc. The hydraulic disc brake is a type of braking mechanism that transfers pressure from the controlling unit, which is usually located close to the vehicle's operator, to the actual brake mechanism, which is typically located at or near the wheel of the vehicle, using brake fluid, which usually contains ethylene glycol. During the braking action, a high temperature may result from the frictional heat produced on the disc and pad interface. As a result, cars often have drum brakes on the back wheels and disc brakes on the front wheels. In addition to having superior stopping power, disc brakes are typically safer and more effective than drum brakes.

1. INTRODUCTION: -

The two parts of an automobile disc brake are a rotating, axially symmetrical disc and stationary pads. The hydraulic disc brake is a type of braking mechanism that uses brake fluid, which typically contains ethylene glycol, to transfer pressure from the controlling unit, which is usually situated near the vehicle's operator, to the actual brake mechanism, which is usually located at or near the wheel of the vehicle. The frictional heat generated on the disc and pad interface during the braking action may cause a high temperature. Cars typically feature disc brakes on the front wheels and drum brakes on the rear wheels as a result. Disc brakes are generally safer and more efficient than drum brakes, and they also provide more stopping power.

2. LITERATURE SURVEY: -

A stationary pad and a revolving, axially symmetrical disc make up a vehicle disc brake. The hydraulic disc brake is a type of braking mechanism that transfers pressure from the controlling unit, which is typically located close to the vehicle's operator, to the actual brake mechanism, which is typically located at or near the wheel of the vehicle, using brake fluid, which usually contains ethylene glycol. A high temperature could result from the frictional heat produced on the disc and pad interface during braking. As a result, cars usually have drum brakes on the back wheels and disc brakes on the front wheels. In addition to offering greater stopping power, disc brakes are typically safer and more effective than drum brakes.

3. METHODOLOGY: -

The technology of a braking system comprises the engineering and technologies that apply to slowing or stopping a machine or vehicle in motion. Braking primarily depends on the conversion of kinetic energy into heat energy through friction; most systems use mechanical components, such as brake shoes or pads, pressed onto a rotating surface, such as a drum or disc, to create friction that opposes the vehicle's movement. The three most common types of brake systems offered are mechanical, hydraulic, and pneumatic; examples of mechanical brakes are disc brakes and drum brakes.To create resistance, they physically rub pieces together, like brake pads and rotors or brake shoes and drums. In order to transfer pressure from the brake pedal to the brake assembly, hydraulic braking systems use brake fluid, a common component of most modern car models.

a) BLOCK DIAGRAM: -

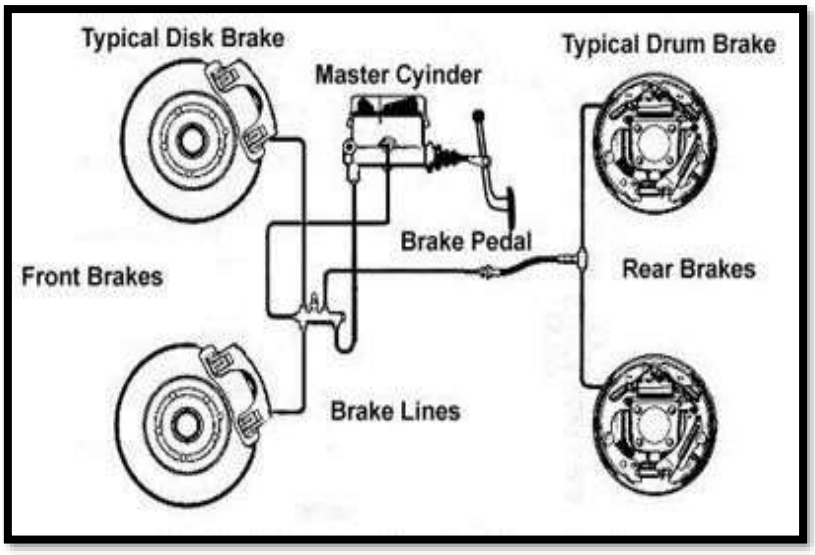

Fig: - Combined Hydraulic and Disc Brake System

b) components: -

i. MASTER CYLINDER

An essential hydraulic component of the vehicle's braking system, the master cylinder uses a cylinder and one or two pistons arranged in a certain way to transform the mechanical energy supplied by the driver—either through the brake pedal on cars or the brake lever on motorcycles—into hydraulic pressure. The brake caliper then receives hydraulic pressure, which enables efficient braking. The brake master cylinder is essentially a multiple unit that provides safe and responsive braking characteristics in a hydraulic brake system by transferring the necessary pressure or braking power to the end braking parts. Although clutch master cylinders are also used in manual automobiles' clutch systems, they are a separate kind of brake master cylinder.

Fig: -Master Cylinder

ii. SLAVE CYLINDER (CALIPER)

An essential component of the hydraulic braking system is the slave cylinder, often known as the brake caliper for disc brakes. Receiving the hydraulic pressure that has been transferred from the master cylinder through the brake lines is how it works. The brake pads are pushed into the braking rotor by the piston inside the slave cylinder, which is activated by the brake fluid entering it. Friction from this slows the wheel down and ultimately stops the vehicle.

Fig: - Slave cylinder (Caliper)

iii. HYDRAULIC LINES

Many different industries, including waste management, manufacturing, agriculture, and pharmaceuticals, depend on hydraulic hoses. They enable a range of operations, including high pressure washing, gas lines, and spray paint application, and can be installed on anything from machinery and trucks to specialized equipment or manufacturing lines.

In a hydraulic system, hydraulic hoses are used to transfer hydraulic fluid between hydraulic components such as pumps, valves, cylinders, and motors. Reinforced tubes called hydraulic hoses are designed to function in hydraulic systems at high temperatures and high pressures.

Fig: -Hydraulic Lines

iv. BRAKE PADS

Through friction, brake pads transform a vehicle's kinetic energy into thermal energy. The brake consists of two brake pads, each of whose friction surfaces faces the rotor. In order to slow and stop the vehicle, the caliper clamps or squeezes the two brake pads onto the rotating rotor when the brakes are applied hydraulically. A dismal grey coating is left on the disc when a brake pad transfers small amounts of its friction material onto it as a result of heating up from contact with the rotor. In order to provide the friction that stops the car, the brake pad and disc—which now both contain the friction material—then "stick" to one another.

Fig: - Brake Pads

V. ADVANTAGES: -

1. Improved Stopping Power
2. Consistent Performance
3. Better Heat Dissipation
4. Lower Maintenance Costs
5. Improved Safety
6. Faster Response Time.
7. Reduced Pedal Effort
8. Enhanced Durability
9. Better Performance in Wet or Harsh Conditions

VI. APPLICATIONS: -

1. Passenger Vehicles: -Most modern cars and motorcycles use combined hydraulic and disc brake systems
2. Commercial Vehicles: -Trucks, buses, and other commercial vehicles also use this braking system
3. Performance and Sports Vehicles: -High-performance cars, racing vehicles, and motorcycles
4. Aircraft (Landing Gear): -Some aircraft use combined hydraulic and disc brake systems
5. Heavy Machinery and Construction Equipment: -Excavators, bulldozers, and other heavy machinery.
6. Electric and Hybrid Vehicles: - Disc brake systems are also found in electric and hybrid vehicles.
7. Motorcycles and Bicycles: -Many motorcycles especially sport and touring models use hydraulic disc brake systems

VII. CONCLUSION: -

A quality braking system considerably lessens the chance of accidents because drivers are able to effectively and promptly stop during emergencies. Modern braking systems attempt to cut stopping distances as far as possible, and this is highly crucial in attempting to avoid collisions and travel safely.

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